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ASTELIAMIRIS, A NEW GENUS OF STENODEMINI FROM THE HAWAIIAN ISLANDS (HETEROPTERA: MIRIDAE)

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Abstract.—Asteliamiris johnpolhemi, a new genus and new species of stenodemine Miridae, is described from the island of Maui, in the Hawaiian Islands. Unlike most members of the Stenodemini which breed on grasses or sedges, both nymphal and adult stages of *A. johnpolhemi* are associated with *Astelia menziesiana* Smith, a member of the Liliaeceae. Dorsal habitus photographs, scanning electron micrographs of the head, scent gland efferent system, and pretarsus, illustrations of the male and female genitalia, and a distribution map are provided.

Unusual habitat shifts are a well known phenomenon in species occurring on oceanic islands. Among the Heteroptera of Hawaii, for example, one finds members of the Saldidae which have moved from a typical riparian existence into arboreal habitats (Cobben, 1980), species of Nabidae which have moved from typical arboreal niches into riparian habitats (Polhemus, 1999), and species of Lygaeidae which have adapted to life at the margins of alpine snowfields (Polhemus, 1998). To this list of ecological divergences may now be added a new genus of Hawaiian stenodemine Miridae which, instead of feeding on grasses like nearly all other members of the tribe, occurs on *Astelia,* a plant belonging to the family Liliaceae.

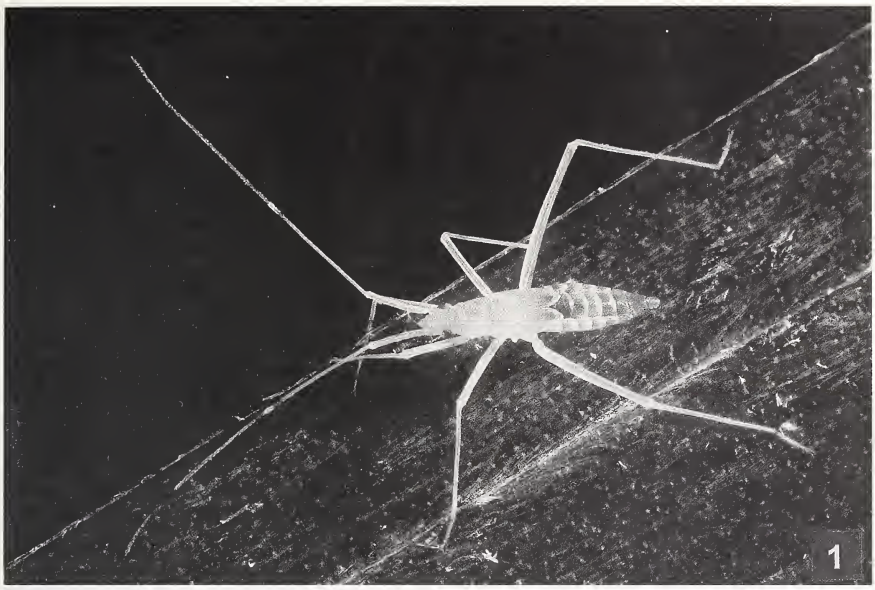
The existence of this odd insect was initially brought to the second author's attention by Betsy Gagné, of the State of Hawaii's Natural Area Reserves System, whose deceased husband Wayne Gagné had discovered the first specimens in Kipahulu Valley, on eastern Maui. Like many of Gagné's inspired entomological discoveries, this one remained vaguely recalled and poorly investigated following his untimely death in 1988, and it was not until 1998 that an expedition was mounted to Kipahulu Valley specifically to search for what had by that time come to be known as the "*Astelia* bug." This foray was successful and, in combination with a few additional specimens captured during concurrent surveys along the northern face of Haleakala, has finally permitted description and illustration of this unique Hawaiian mirid.

All measurement are given in millimeters.

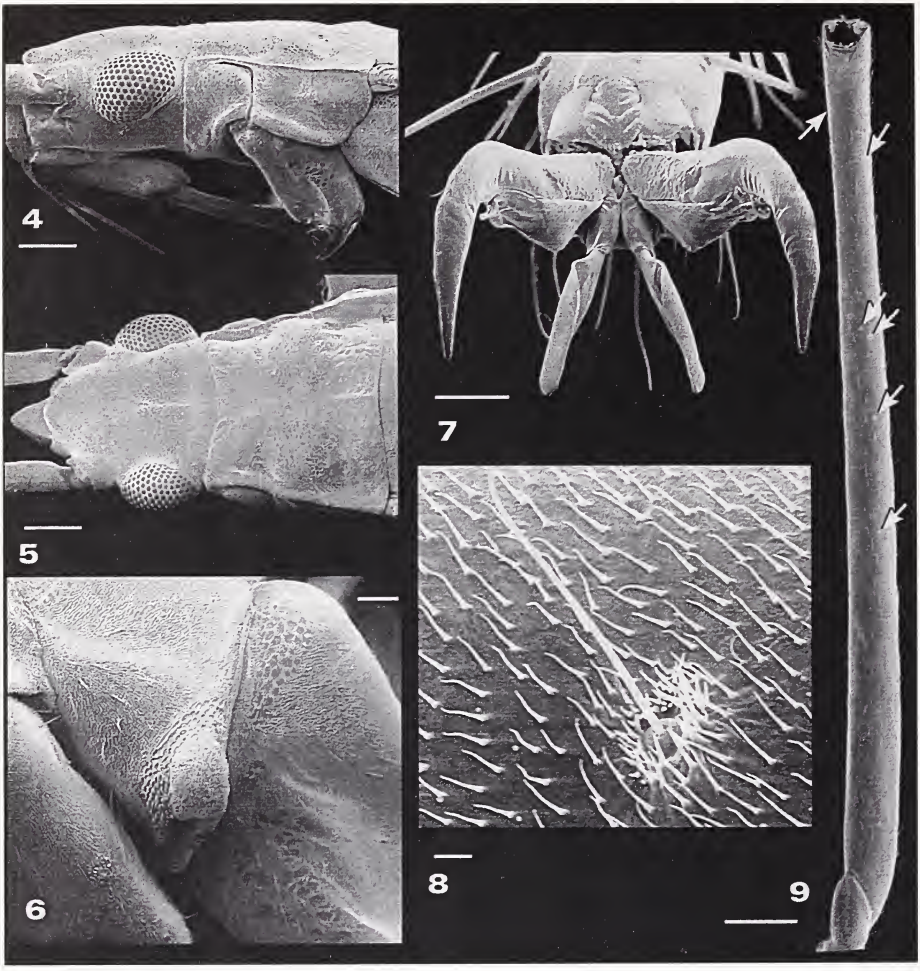
Asteliamiris, new genus

Figs. 1–17, 19

Diagnosis. Distinguished from other stenodemine genera by the following combination of characters: pretarsus with minute pulvillus; head with medial longitudinal



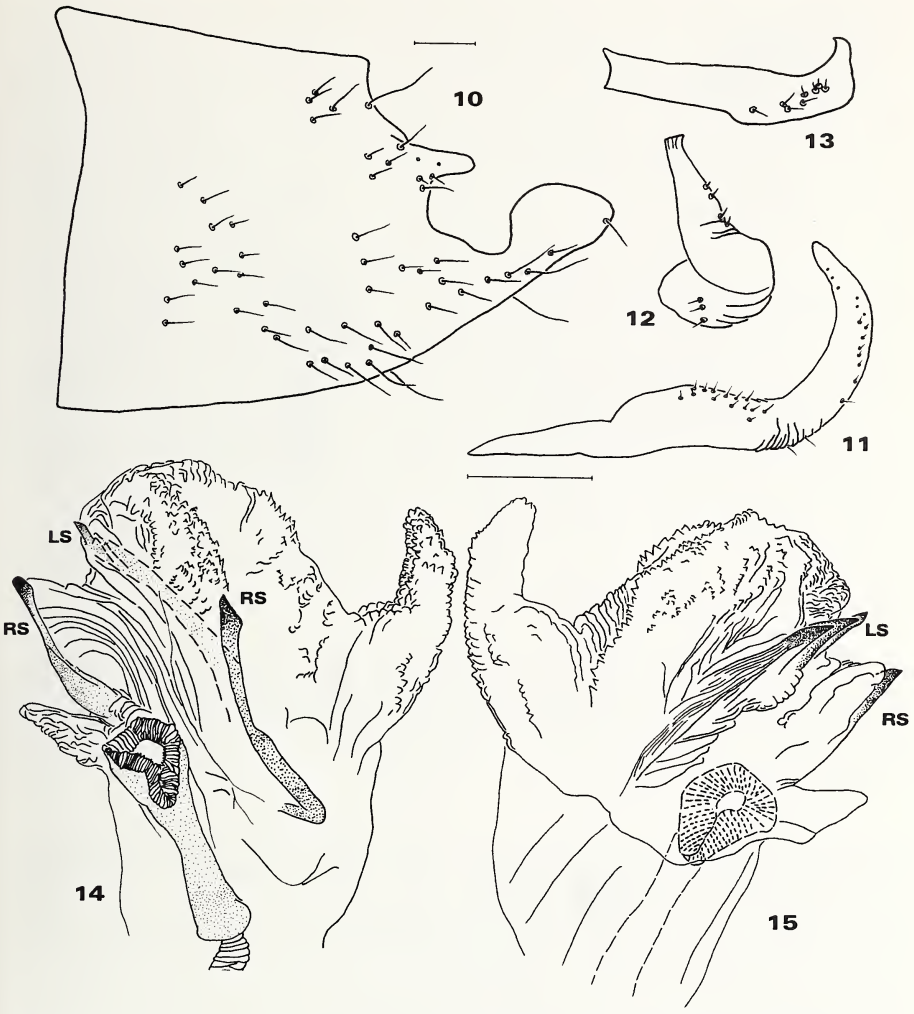
Figs. 1–3. 1. Habitus photograph of *Asteliamiris johnpolhemi* (photo courtesty Bill Mull). 2. Photograph of *A. johnpolhemi,* dorsal view (photo courtesty Bill Mull). 3. Type locality of *Asteliamiris johnpolhemi* on Mauka Ridge, Haleakala National Park. Note the clumps of *Astelia menziesiana* below an overstory of *Metrosideros polymorpha.*



Figs 4–9. Photomicrographs of *Asteliamiris johnpolhemi*. 4. Head and propleuron, lateral view, scale bar = 200 μ. 5. Head, pronotum, dorsal view, scale bar = 200 μ. 6. Ostiolar peritreme, lateral view, scale bar = 50 μ. 7. Pretarsus; apical view, scale bar = 20 μ. 8. Detail of penultimate distal metafemoral trichobothrium, scale bar = 5 μ. 9. Metafemur, ventral view, arrows denote trichobothria; scale bar = 300 μ.

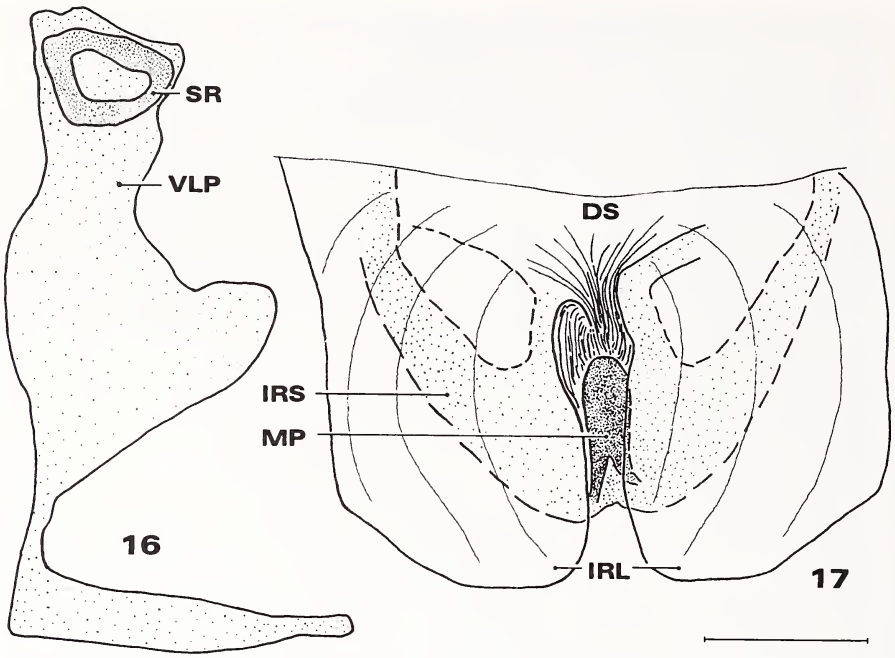
sulcus on frons; eyes not strongly projecting, broadly joined to head; obscurely rugulopunctate dorsum; short setae on antennal segment 2 and metatibia; length of antennal segment 1 less than combined length of the head and pronotum; absence of long dark setae on base of antennal segment 2; brachypterous hemelytra; length of antenna twice as long as body; long legs; maxillary plate with obvious blunt tubercle on anterior margin; and genitalia, especially the vesica with a three-pointed lobal sclerite and the obscure sclerotized rings.

Description. *Adult male.* (Figs. 1, 2). *Dorsal aspect:* moderate body size; head,



Figs. 10–15. *Asteliamiris johnpolhemi*, male genitalia. 10. Genital capsule, lateral view. 11. Left paramere, lateral view. 12. Left paramere, apical view. 13. Right paramere, lateral view. 14, 15. Vesica; LS, lobal sclerite; RS, ribbion-like strap. 14. Dorsal view. 15. Ventral view. Scale bar = 0.1 mm.

pronotum, mesoscutum, and scutellum smooth; hemelytra smoothly rugulopunctate. *Vestiture:* dorsum with sparsely distributed, short, suberect, pale simple setae (best examined in lateral view); antennal segments with moderately and uniformly distributed, suberect, pale, simple setae with length slightly longer than setae on dorsum; segment 1 without bristle-like setae. Legs with moderately densely distributed, suberect simple setae with length slightly shorter than width of metatibia, color slightly darker than antennal setae; interior surface of metatibia without minute, stout, black



Figs. 16, 17. *Asteliamiris johnpolhemi*, female genitalia.16. Left sclerotized ring and ventral labiate plate, dorsal view; SR, sclerotized ring; VLP, ventral labiate plate. 17. Posterior wall, ventral view; DS, dorsal structure; IRL, inter-ramal lobe; IRS, inter-ramal sclerite; MP, median process. Scale bar = 0.1 mm.

spicules; tibiae without bristle-like setae. *Head* (Figs. 4, 5): acutely triangular in dorsal view, subrectangular in lateral view; eye relatively small, subovate, slightly protruding from lateral margin of head in dorsal view, anterior margin emarginate, removed from antennal socket and anterior margin of pronotum by distance slightly less than basal diameter of antennal segment 1; basal carina of vertex broadly and slightly elevated; frons with moderately deep longitudinal sulcus; anterior margin of frons elevated dorsal to, but not anterior to base of clypeus, even with anterior margin of maxillary and mandibular plates, and slightly anterior to antennal socket; clypeus protuberant, slightly pointed; maxillary plate with obvious blunt tubercle on anterior margin; antennal socket situated dorsal to ventral margin of eye, anteroventral margin with smaller tubercle; width of gena twice diameter of antennal segment 1; buccula short; buccular cavity small reaching middle of head in lateral view; labium reaching apex of mesocoxa; segment 1 just reaching base of head. *Antenna:* longer than twice length of body; segment 1 twice as long as length of head; 2 thinner than 1 and longer than 3, 3 longer than 4; 3 and 4 filamentous. *Pronotum* (Figs. 4, 5): subquadrate, with indistinct anterior and posterior lobes, slightly convex, lateral margin almost straight, lateral margin, including region dorsal to coxal cleft, carinate; proepisternum visible in dorsal view; calli indistinct, not reaching lateral margin of pronotum; collar flattened, with distinct posterior sulcus; coxal incisure deep, reach-

ing under lateral carina; Ostiolar peritremal disk (Fig. 6) with small rounded prominence and small evaporative surface. *Mesoscutum and scutellum:* confluent, flattened, except for somewhat raised dark apex. *Hemelytra:* brachypterous, without cuneus or membrane, only claval vein present; apex narrowly rounded; length equal to combined length of head, pronotum, and scutellum; embolium relatively wide, carinate laterally; hind wing absent. *Venter:* uniformly pale yellowish green with sparsely distributed, suberect, pale simple setae. *Legs:* long, rounded, narrow throughout, except metafemora slightly thickened at base; metatibia longer than metafemora and abdomen, slightly shorter than antennal segment 2; apex of protibia slightly flattened, with longer mesially directed setae and minute, apical, comb-like spinules; metatarsus with segment 1 longer than combined length of segments 2 and 3; mesofemora with six trichobothria, metafemora with six trichobothria (Figs. 8, 9). *Claws* (Fig. 7): with relatively moderate length, strongly curved; paraempodium lamellate, diverging distally; pulvillus minute, situated just mesal to bend in claw. *Genitalia*: Genital capsule: elongate-conical, with narrow, laterally deflected tubercle dorsal to left paramere insertion; posteroventral portion of capsule produced (Fig. 10). Left paramere: small, sensory lobe elongate, slightly produced above arm; arm short; shaft short thick at base, abruptly narrowed distally; apex recurved, pointed; surface with short setae (Figs. 11, 12). Right paramere: small, linear, slightly expanded medially; abruptly constricted distally to narrowed ventrally directed pointed apex, surface with short setae (Fig. 13). Vesica: ductus seminis narrow throughout; secondary gonopore with complete, moderately large aperture with deep ventral cleft; membrane surface deeply wrinkled, with one large, somewhat rounded, central lobe and several small, narrow lateral lobes; back of central lobe with prominent lobal sclerite with three spine-like lobes; base of vesica with obscure ribbon-like strap attached to back of base of ductus seminis, extending dorsal and curving around bases of faint, thin sclerites forming two socket-like structures left and right of secondary gonopore (Figs. 14, 15).

Female. Similar to male in all features except coloration. *Genitalia:* Sclerotized rings: small, D-shaped, aperture obscure, apparently open (Fig. 16). Ventral labiate plate: large, present behind rings, barely extending medially, not spanning rings (Fig. 16). Posterior wall (Fig. 17): inter-ramal sclerite faint or entirely membranous; median process well sclerotized, without projecting dorsal or posterior sections, but with two small basal projections; dorsal structure not sac-like, broadly open anteriorly, and flattened dorsally; inter-ramal lobes present as two large, widely separated lobes, with apices directed ventrally and surpassing ventral margin of sclerite, obscuring entire sclerite.

Etymology. Named for the apparent strict host association of the included species with *Astelia menziesiana* Smith (Liliaeceae), and from *miris,* pertaining to the family Miridae.

Type species. *Asteliamiris johnpolhemi* Schwartz and Polhemus.

Discussion. *Asteliamiris* will key with difficulty to *Trigonotylus* in the key to adult stenodemine genera of the World in Schwartz (1987), but the brachypterous hemelytra, long antenna and legs, genitalia, and habitat will easily separate the new genus from species of this cosmopolitan grass-feeding genus. Only the type species, an apparent Maui endemic, is currently placed in this genus. *Asteliamiris* nicely fits in the *Trigonotylus*-group of genera, which comprises *Chaetedus* Eyles, *Dolichomiris*

Fig. 18. Habitus photograph of *Kuscheliana masatierrensis* Carvalho on *Rumohra berteroana* (Colla) Rodr.

Reuter, *Megaloceroea* Fieber, *Schoutedenomiris* Carvalho, and *Trigonotylus* Fieber (Schwartz, 1987); endemic species of the latter genus are also present in Hawaii, but whether they constitute the ancestral stock from which *Asteliamiris* was derived is uncertain. The following synapomorphic characters support the group: dorsal surface without punctures; genital segment of male with tubercle(s) present dorsal to the left and sometimes the right paramere; sensory lobe of left paramere only slightly projecting above surface of arm; vesica with basal processes sometimes developed into socket-like structures; and the inter-ramal sclerite with an obsolete dorsal structure and large inter-ramal lobes with widely separated apices which converge mesially and surpass the ventral margin of the sclerite.

Asteliamiris is only the second recorded genus of stenodemine which exploits non-grass or sedge host plants (Schuh, 1995). Carvalho (1952) reported that *Kuscheliana masatierrensis* Carvalho lives among ferns (*Rumohra berteroana* (Colla) Rodr. [Davalliaceae]) in the dark and damp recesses of the forest. This unrelated genus, endemic to the Juan Fernandez Islands, exhibits similar morphology, i.e., brachyptery, long legs and antennae (Fig. 18), to the Maui endemic *Asteliamiris*. These shifts to non-grass hosts and convergent morphologies suggest that there may be a typical and predictable suite of responses by stenodemines which manage to colonize isolated oceanic islands, and that more members of this tribe should be searched for in atypical habitats throughout the Pacific.

Asteliamiris johnpolhemi, new species
Figures 1–17, 19

Diagnosis. The characters given in the generic diagnosis, especially the long legs and antenna, will distinguish this species from *Trigonotylus hawaiiensis* Kirkaldy

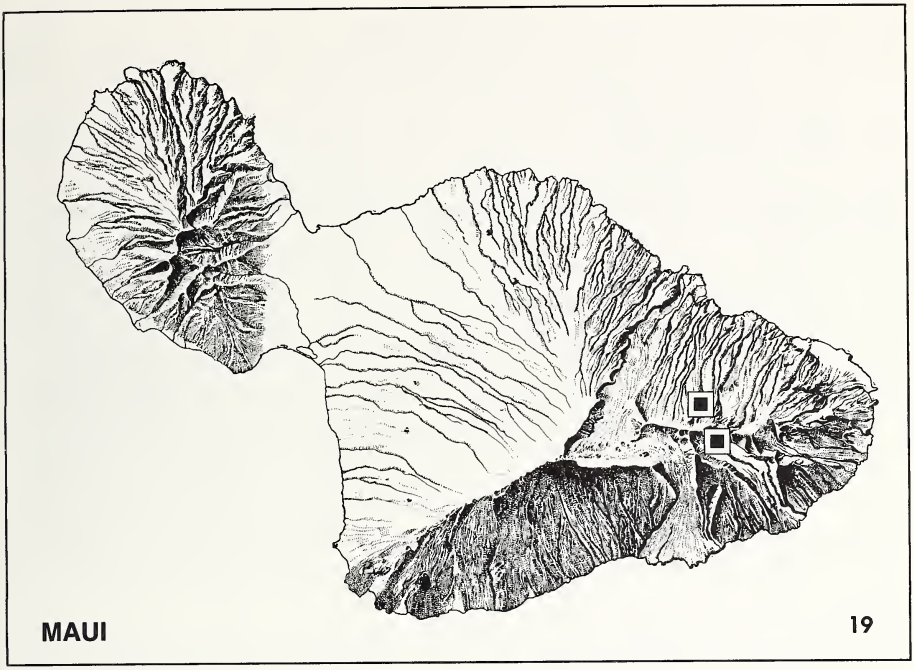


Fig. 19. Distribution of *Asteliamiris johnpolhemi* on Maui.

and *T. usingeri* Carvalho, which also occur on the Hawaiian Islands, but in the open, subalpine grassland zone above the upper montane wet forests where *A. johnpolhemi* is found.

Description. *Adult male.* Yellowish-green, with black subapical annulate ring on antennal segment 2, base and distal portion of segment 3, except apex, segment 4, and apex of tarsal segment 3. *Measurements* (N = 4; mean, range): Body length from apex of clypeus to apex of genital segment 4.50 (4.40–4.70); body length from apex of clypeus to apex of hemelytra 2.80 (2.65–3.00); length of hemelytra 1.43 (1.30–1.55); maximum width of pronotum 0.78 (0.73–0.80); median length of pronotum 0.57 (0.55–0.60); median length of head 0.83 (0.78–0.88); width of head across eyes 0.73 (0.69–0.76); vertex width 0.42 (0.40–0.43); dorsal eye width 0.17 (0.16–0.18) lateral height of eye 0.29 (0.28–0.29); labium length 1.84 (1.75–1.92); antennal measurements 1, 1.61 (1.54–1.68); 2, 3.17 (3.03–3.35); 3, 2.75 (2.55–3.05); 4, 1.48 (1.30–1.60). *Genitalia:* see Figs. 10–15.

Female. Similar to male except antennal segment 3 with more obvious wide basal and subapical black annuli. *Measurements* (N = 6; mean, range): Body length from apex of clypeus to apex of genital segment 5.26 (5.15–5.35); body length from apex of clypeus to apex of hemelytra 3.04 (2.85–3.25); length of hemelytra 1.59 (1.45–1.75); maximum width of pronotum 0.83 (0.78–0.88); median length of pronotum 0.60 (0.51 0.65); median length of head 0.85 (0.78–0.98); width of head across eyes 0.76 (0.74–0.79); vertex width 0.43 (0.40–0.45); dorsal eye width 0.16 (0.16–0.18)

lateral height of eye 0.28 (0.26–0.30); labium length 1.93 (1.85–2.00); antennal measurements 1, 1.61 (1.58–1.73); 2, 3.09 (2.85–3.28); 3, 2.57 (2.35–2.85); 4, 1.58 (1.55–1.65). *Genitalia:* see Figs. 16, 17.

Etymology. Named in honor of Dr. John T. Polhemus for his significant contributions to the study of Heteroptera.

Discussion. *Asteliamiris johnpolhemi* occurs in upper elevation wet forests on the windward slopes of Haleakala Volcano, eastern Maui. The type locality is a narrow, elongate ridge at the head of Kipahulu Valley, separating the drainages of Palikea and Koukouai streams, and known informally to workers at the Haleakala National Park as "Mauka Ridge" (the Hawaiian word "mauka" meaning to go upward in the direction of the mountains). The crest of this ridge is exposed to the prevailing trade winds, receiving large amounts of rain and mist, and supporting a closed canopy forest of ohia trees (*Metrosideros polymorpha* Gaudichard-Beaupré), with a relatively open understory below, containing scattered clumps of *Astelia menziesiana* Smith (Fig. 3). *Asteliamiris johnpolhemi* was moderately abundant within these *Astelia* clumps, from which individuals could be dislodged by beating or shaking the leaves over a net or beating sheet. When disturbed, the insects would often retreat to the undersides of leaves or deeper into the basal section of the plant, in a manner similar to those temperate zone mirids living on rosette plants such as *Yucca* or *Agave.*

Host. Breeds on *Astelia menziesiana* Smith (Liliaeceae).

Distribution. Known from wet forests on the northern and eastern slopes of Haleakala, East Maui, Hawaiian Islands.

Types. Holotype, male, HAWAIIAN ISLANDS, **Maui**, Mauka Ridge, Kipahulu Valley, Haleakala National Park, 2,060 m (6,750 ft), 21 May 1998, 20°43.65′N, 156°07.43′W, ex *Astelia menziesiana* Smith (Liliaeceae), CL 8334, D.A. Polhemus, deposited in National Museum of Natural History, Smithsonian Institution, Washington, DC (USNM). Paratypes: HAWAIIAN ISLANDS, **Maui**: 9 males, 16 females, same data as holotype; deposited in the Bishop Museum, Honolulu, Hawaii; Canadian National Collection, Ottawa, Ontario, and USNM; 1 male, Haleakala, Poo Uli Cabin area, on north slope near headwaters of Kuhiwa Stream, Hanawi Natural Area Reserve, 1,585 m (5,200 ft), 5–6 May 1998, 20°45.03′N, 156°07.40′W, CL 8324, D. A. Polhemus (USNM).

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